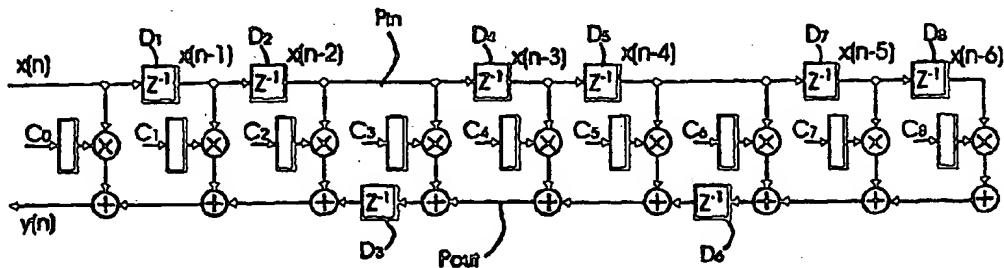




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H03H 17/06, H04B 3/23, 3/32, H04L 25/14, 25/497, 1/00		A3	(11) International Publication Number: WO 00/28663 (43) International Publication Date: 18 May 2000 (18.05.00)									
<p>(21) International Application Number: PCT/US99/26483</p> <p>(22) International Filing Date: 9 November 1999 (09.11.99)</p> <p>(30) Priority Data:</p> <table> <tr> <td>60/107,877</td> <td>9 November 1998 (09.11.98)</td> <td>US</td> </tr> <tr> <td>60/108,319</td> <td>13 November 1998 (13.11.98)</td> <td>US</td> </tr> <tr> <td>60/130,616</td> <td>22 April 1999 (22.04.99)</td> <td>US</td> </tr> </table> <p>(71) Applicant (for all designated States except US): BROADCOM CORPORATION [US/US]; 16215 Alton Parkway, Irvine, CA 29618 (US).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only): HATAMIAN, Mehdi [US/US]; 25681 Pacific Hills, Mission Viejo, CA 92692 (US).</p> <p>(74) Agent: HOANG, Phuong-Quan; Christie, Parker &amp; Hale, LLP, P.O. Box 7068, Pasadena, CA 91109-7068 (US).</p>		60/107,877	9 November 1998 (09.11.98)	US	60/108,319	13 November 1998 (13.11.98)	US	60/130,616	22 April 1999 (22.04.99)	US	<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p> <p>(88) Date of publication of the international search report: 17 August 2000 (17.08.00)</p>	
60/107,877	9 November 1998 (09.11.98)	US										
60/108,319	13 November 1998 (13.11.98)	US										
60/130,616	22 April 1999 (22.04.99)	US										

## (54) Title: FIR FILTER STRUCTURE WITH LOW LATENCY FOR GIGABIT ETHERNET APPLICATIONS



## (57) Abstract

A digital filter has an input path and an output path and includes a set of delay elements and a number of taps. The taps couple the input path to the output path. Each of the taps has a coefficient, a multiplier and an adder. Each of the delay elements is disposed between two adjacent taps. The delay elements are placed in either the input path and the output path of the digital filter, such that the digital filter has fewer delay elements in the input path than a direct-form digital filter with the same number of taps in a direct-form structure, and has fewer delay elements in the output path than a transposed-form digital filter with the same number of taps in a transposed-form structure; and such that the digital filter has same transfer function as the direct-form digital filter and the transposed-form digital filter.

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**INTERNATIONAL SEARCH REPORT**

Int'l. Application No
PCT/US 99/26483

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7	H03H17/06	H04B3/23	H04B3/32	H04L25/14	H04L25/497
	H04L1/00				

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03H H04B H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DUNCAN ET AL.: "Strategies for design automation of high speed digital filters"          JOURNAL OF VLSI SIGNAL PROCESSING,          vol. 9, no. 1/2, September 1995 (1995-09),          pages 105-118, XP000525889          Dordrecht, NL          page 105, left-hand column, paragraph 1          page 105, right-hand column, paragraph 3          page 108, right-hand column, paragraph 2 -          paragraph 4          page 108, right-hand column, paragraph 6          -page 109, left-hand column, paragraph 1</p> <p align="center">-/-</p>	1-20

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patenttaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 99/26483

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>CARAISCOS, PEKMESTZI: "Low-latency bit-parallel systolic VLSI implementation of FIR digital filters"          IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS II: ANALOG AND DIGITAL SIGNAL PROCESSING, vol. 43, no. 7, July 1996 (1996-07), pages 529-534, XP000630793          New York, US          ISSN: 1057-7130          page 529, right-hand column, paragraph 2</p> <p>-----</p> <p>PEKMESTZI, CARAISCOS: "Implementation of systolic multipliers and digital filters via signal flow-graph transformations"          THE MEDITERRANEAN ELECTROTECHNICAL CONFERENCE, 12 - 14 April 1994, pages 105-108, XP000506110          New York, US ISBN: 0-7803-1773-4          page 107, left-hand column, paragraph 1</p> <p>-----</p> <p>WO 98 43369 A (LEVEL ONE COMMUNICATIONS )          1 October 1998 (1998-10-01)          page 7, line 25 - line 28</p> <p>-----</p>	1-20
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A		1,11

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/US 99/26483

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